

Note that the abstract as currently written essentially reflects claim 1 and one of its dependent claims (claim 2), yet there are nineteen other claims dependent, directly of [sic] indirectly, from claim 1 alone and many of the disclosed features of the present invention are not mentioned at all.

The Examiner seems to be confusing an abstract with a detailed description. The statement above appears to suggest that there is some requirement for each and every dependent claim feature to be mentioned in the abstract. Such a position is clearly unsupportable, and contrary to the regulations. In accordance with 37 C.F.R. §1.72(b), the abstract should be “brief,” that is, it “may not exceed 150 words in length,” and should enable one “to determine quickly from a cursory inspection the nature and gist of the technical disclosure.” Applicants have been unable to find in 37 C.F.R. §1.72(b), or in the corresponding portion of the MPEP, §608.01(b), any indication that a proper abstract must mention each and every dependent claim feature, as alleged by the Examiner.

The amended abstract clearly meet the brevity requirement. Moreover, the Examiner in the above-quoted statement has explicitly acknowledged that the amended abstract accurately reflects the broadest independent claim and at least one additional dependent claim. As such, the abstract is believed to convey “the nature and gist of the technical disclosure,” and to be compliant with 37 C.F.R. §1.72(b) and MPEP §608.01(b). Applicants respectfully submit that the objection to the amended abstract is improper and should be withdrawn.

The Examiner has objected to the formal drawings on a number of grounds. Applicants respectfully traverse. Applicants respectfully submit that the formal drawings as filed are compliant with 35 U.S.C. §113 and 37 C.F.R. §1.81. The drawing amendments proposed by the Examiner are believed to relate entirely to subjective preference, rather than to any actual statutory or regulatory deficiency in the formal drawings as filed.

For example, the objected-to abbreviation NI in FIGS. 1 and 2 is clearly defined at page 5, line 7 of the specification. The Examiner appears to acknowledge that the proposed amendment on this point is “not critical given the explanation in the specification.” See the final Office Action at page 5, lines 10-13.

As another example, Applicants have chosen to utilize as a shorthand notation the term “set {a, b, c}” in FIG. 4 of the drawings rather than “set of nodes {a, b, c}.” The Examiner argues that this shorthand notation is somehow “confusing and misleading,” but even a cursory reading of the specification indicates that there is no possibility of confusion with regard to the term at issue. The specification at page 7, lines 7-8, clearly indicates that each of the nodes in the set {a, b, c} “may represent a node of a multiprocessor system such as that illustrated in conjunction with FIGS. 1 and 2.” In the corresponding text describing FIGS. 1 and 2, at page 5, lines 7-8, it is explicitly stated that the nodes A, B and C include respective processors 106A, 106B and 106C. Thus, it is not “confusing or misleading” to refer to processors in the set {a, b, c}, since the set clearly includes processors, one corresponding to each of the nodes.

As to the flow diagram of FIG. 5 and its associated text, the current flow diagram format is the one which Applicants have chosen to use in describing their invention, and said format is believed to satisfy all statutory and regulatory requirements. For example, with regard to box 202, there is no need to insert the word --current-- before “readers” because the specification at page 7, line 15, provides this additional detail. Again, the use of a shortened form, in this case for the text in box 202, is entirely appropriate in view of the additional detail provided in the specification. There is no statutory or regulatory requirement that a given box in a flow diagram exactly replicate the corresponding text of the specification, and in fact it is common practice to utilize shortened or abbreviated descriptions of this type in flow diagram boxes. The other points raised with regard to the content of the various boxes of the FIG. 5 flow diagram are similarly deficient. Basically, the gist of the objection to FIG. 5 appears to be that the box text does not exactly replicate the corresponding specification text, but Applicants submit that the specification text itself removes any potential for a lack of clarity.

Applicants therefore submit that the drawing objections are improper and should be withdrawn.

Claims 1-4, 10, 21-25, 28-31 and 34 stand rejected under 35 U.S.C. §102(b) as being anticipated by S. Kaxiras, “Identification and Optimization of Sharing Patterns for Scalable Shared-Memory Multiprocessors” Ph.D. Thesis, Computer Sciences, University of Wisconsin-Madison, 1998 (hereinafter “Kaxiras”), which was cited by Applicants on their Information Disclosure

Statement filed concurrently with the present application. Applicants note that the author S. Kaxiras of this primary reference and inventor Stefanos Kaxiras named on the present application are one and the same person.

Applicants respectfully traverse the §102(b) rejection on the ground that the Examiner has failed to establish anticipation of at least independent claims 1, 22 and 28 by the Kaxiras reference.

The Manual of Patent Examining Procedure (MPEP), Eight Edition, August 2001, §2131, specifies that a given claim is anticipated “only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference,” citing Verdegaal Bros. v. Union Oil Co. of California, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). Moreover, MPEP §2131 indicates that the cited reference must show the “identical invention . . . in as complete detail as is contained in the . . . claim,” citing Richardson v. Suzuki Motor Co., 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

The present invention as set forth in claim 1 is directed to a method of determining a set of predicted readers of a data block in a multiprocessor system. The method includes the steps of determining a current set of readers of a data block which is subject to a write request, and generating the set of predicted readers based on the current set of readers and at least one additional set of readers representative of at least a portion of a global history of a directory associated with the data block.

It is particularly important to note that the claimed arrangements utilize a global history of a directory. This aspect of the invention is described in the following manner at page 6, lines 18-26 of the specification, with emphasis supplied:

The present invention in an illustrative embodiment provides a directory-based prediction mechanism which predicts the next set of readers of a block when a write request goes from the writer to the directory associated with the block. The mechanism predicts a likely set of readers of the value produced by the writer, and after the writer has finished writing, this prediction is used to forward the data to all the predicted readers. Unlike conventional predictors which distinguish among blocks or among instructions to keep separate histories for blocks in the system, the prediction mechanism of the present invention

merges together multiple sets of readers for multiple blocks served by the directory. This information is referred to herein as the global history of the directory.

Additional description relating to the global history of a directory is provided at, for example, page 10, lines 19-25 of the specification.

Applicants respectfully submit that Kaxiras fails to teach or suggest the claimed prediction arrangements involving use of a global history of a directory associated with a data block, and thus fails to provide the associated advantages of the type described at page 4, lines 5-7 of the specification.

The Examiner in formulating the §102(b) rejection of claim 1 over Kaxiras relies on the discussion at pages 206-207 thereof, and more particularly relies on the intersection-prediction approach described at page 207, section 2. This intersection-prediction approach is described in Kaxiras as follows:

The predictor is updated when the producer invalidates a sharing list and the identities of the consumers are collected on a temporary bit-map. The logical AND of the temporary bit-map and the predictor entry bit-map (that contains the consumers of the previous store-miss or store-write-fault) constitutes the prediction bit-map. After the prediction bit-map is calculated, the temporary bit-map is installed over the predictor entry's bit-map.

There is no mention whatsoever in this description regarding the claimed utilization of a global history of a directory associated with a data block. In fact, it appears that the cited passage is more properly viewed as simply an example of one of the “conventional predictors” referred to in the previously-quoted description from page 6, lines 18-26 of the specification. The other portions of Kaxiras relied upon by the Examiner similarly fail to teach or suggest the claimed utilization of a global history of a directory.

In the final Office Action, at page 9, second paragraph, the Examiner argues that the “at least a portion of” language which precedes the term “global history” in claim 1 renders Kaxiras

anticipatory, because “information regarding the sets of different consumers may be considered to represent a ‘global history.’” Applicants respectfully disagree. The argument proffered by the Examiner ignores the fact that the specification defines the term “global history” in a manner which distinguishes conventional predictors such as that described in Kaxiras. For example, as indicated above, the specification at page 6, lines 18-26, includes the following recitation:

Unlike conventional predictors which distinguish among blocks or among instructions to keep separate histories for blocks in the system, the prediction mechanism of the present invention merges together multiple sets of readers for multiple blocks served by the directory. This information is referred to herein as the global history of the directory.

The Examiner is in effect taking a conventional predictor and alleging that it anticipates “at least a portion of a global history of a directory” as claimed. However, since there is no global history of a directory described in Kaxiras, Kaxiras cannot be reasonably construed as being anticipatory of a portion of such a global history.

Claim 1 therefore includes limitations which are not taught or suggested by Kaxiras. The anticipation rejection of claim 1 is thus believed to be improper and should be withdrawn.

Independent claims 22 and 28 are not anticipated by Kaxiras for reasons similar to those identified above with regard to claim 1.

Dependent claims 2-4, 10, 21, 23-25, 28-31 and 34 are believed allowable for at least the reasons identified above with regard to independent claim 1, and these claims are also believed to specify additional separately-patentable subject matter over Kaxiras and the other art of record.

Claims 5-7, 11-20, 26, 27, 32 and 33 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Kaxiras. Applicants respectfully traverse. These dependent claims are allowable for at least the reasons identified above with regard to their respective independent claims, and are believed to specify additional separately-patentable subject matter over Kaxiras.

For example, dependent claim 5 specifies that the global history of the directory comprises a plurality of sets of previous readers processed by the directory, with the total number of the plurality of sets of previous readers corresponding to a designated history depth associated with

generation of the set of predicted readers. As outlined above, there is no mention whatsoever in Kaxiras regarding a global history of a directory, as that term is defined in the specification, much less the particular global history limitations recited in claim 5.

The Examiner acknowledges that Kaxiras fails to meet the particular limitations recited in claim 5, but argues that such limitations would be obvious in view of Kaxiras. In support of his argument, the Examiner provides the following statement regarding obviousness, at pages 9-10, section 5, of the final Office Action, with emphasis supplied:

Kaxiras . . . does not teach that the history information comprise a plurality of sets of previous readers processed by the directory. However, one of ordinary skill in the art would readily recognize that maintaining more than one set of previous readers in the history information allows one to better track the history of the previous readers or consumers and improve the prediction ability of the prediction scheme. Accordingly, it would have been readily obvious to one of ordinary skill in the art at the time the claimed invention was made to store of [sic] a plurality of sets of previous readers in the history information of Kaxiras in order to improve the prediction ability and thereby improve system performance by more accurately predicting where to “pre-send” information.

Applicants submit that this is a conclusory statement of obviousness, and insufficient to support the proposed modification of the reference teachings.

The Federal Circuit has stated that when patentability turns on the question of obviousness, the obviousness determination “must be based on objective evidence of record” and that “this precedent has been reinforced in myriad decisions, and cannot be dispensed with.” In re Sang-Su Lee, 277 F.3d 1338, 1343 (Fed. Cir. 2002). Moreover, the Federal Circuit has stated that “conclusory statements” by an examiner fail to adequately address the factual question of motivation, which is material to patentability and cannot be resolved “on subjective belief and unknown authority.” Id. at 1343-1344. There has been no showing in the present §103(a) rejection of objective evidence of record that would motivate one skilled in the art to modify Kaxiras in the manner alleged by the Examiner. The above-quoted statement of obviousness given by the Examiner in the Office

Action is precisely the type of subjective, conclusory statement that the Federal Circuit has indicated provides insufficient support for an obviousness rejection. It appears, in view of the above-quoted statement of obviousness provided by the Examiner, that the Examiner in rejecting claim 5 over Kaxiras has simply undertaken a hindsight-based piecemeal reconstruction of the claimed invention based on the disclosure provided by Applicants. Such an approach is improper.

Similarly, the shift register limitation of claim 6, and the particular history depth limitation of claim 7, are not obvious in view of Kaxiras. Kaxiras fails to teach or suggest a global history of a directory, much less the claimed use of a shift register to implement such a history, or the claimed use of a history depth greater than two.

Claims 8 and 9 stand rejected under §103(a) as being unpatentable over Kaxiras in view of U.S. Patent No. 6,032,228 (hereinafter “Islam”). Applicants respectfully traverse. The Islam reference fails to supplement the fundamental deficiencies of Kaxiras as applied to the independent claims, in that it fails to provide any teaching or suggestion regarding the claimed utilization of a global history of a directory.

With regard to the §103(a) rejection over Kaxiras and Islam, Applicants note that a proper *prima facie* case of obviousness requires that the cited references when combined must “teach or suggest all the claim limitations,” and that there be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to combine the references or to modify the reference teachings. See Manual of Patent Examining Procedure (MPEP), Eighth Edition, August 2001, §706.02(j).

Applicants submit that the Examiner has failed to establish a proper *prima facie* case of obviousness in the present §103(a) rejection, in that the Kaxiras and Islam references, even if assumed to be combinable, fail to teach or suggest all the claim limitations, and in that no cogent motivation has been identified for combining the references or modifying the reference teachings to reach the claimed invention.

Dependent claim 8 specifies that each reader in the system maintains an accessed bit for each of a plurality of data blocks, the accessed bit of a particular reader for a given data block indicating whether the particular reader has actually read the given data block.

The Examiner acknowledges that this limitation is not shown in Kaxiras, but argues that it is met by the proposed combination of Kaxiras and Islam. More particularly, the Examiner relies on the “accessed bit” disclosed in column 3, lines 44-47, of Islam. However, the relied-upon accessed bit of Islam is clearly described therein as being maintained for a particular cache entry. Applicants respectfully submit that an accessed bit for a cache entry is not an accessed bit of the type claimed, the latter explicitly described as being maintained by a reader for a given data block indicating whether that particular reader has read the data block. Instead, the accessed bit for the cache entry in Islam simply indicates whether or not that cache entry has been accessed by any reader. In other words, there is no reader-specific information maintained by the accessed bit disclosed in Islam. The combined teachings of Kaxiras and Islam therefore fail to meet the limitations of claim 8.

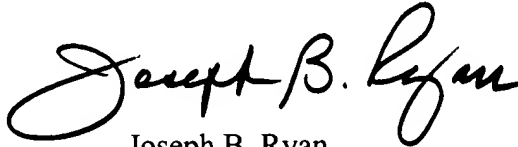
The Examiner states that it would be obvious to combine Kaxiras and Islam “in order to obtain feedback on the actual use of the data and thereby improve system performance.” Again, this is a conclusory statement of obviousness of the type prohibited by the In re Sang-Su Lee case cited above. In addition, the proposed combination would clearly fail to provide the benefits associated with the reader-specific information of the claimed accessed bit.

With regard to dependent claim 9, this claim specifies that accessed bit information is sent by the particular reader to the directory in conjunction with an invalidation acknowledgment. There is no teaching in the proposed combination regarding this particular limitation. The accessed bit of Islam, relied upon by the Examiner, does not indicate whether a particular reader has read a corresponding data block, nor is it sent anywhere by any particular reader. All that the Examiner provides in formulating the §103(a) rejection of claim 9 is another conclusory statement of obviousness, to the effect that the limitations would be obvious “so as to reduce the amount [sic] coherence traffic.”

In view of the above, Applicants believe that claims 1-34 are in condition for allowance, and respectfully request the withdrawal of the §102(b) and §103(a) rejections.

As indicated previously, a Notice of Appeal is submitted concurrently herewith.

Respectfully submitted,

A handwritten signature in black ink that reads "Joseph B. Ryan". The signature is written in a cursive, flowing style.

Date: July 6, 2004

Joseph B. Ryan
Attorney for Applicant(s)
Reg. No. 37,922
Ryan, Mason & Lewis, LLP
90 Forest Avenue
Locust Valley, NY 11560
(516) 759-7517

Enclosure(s): Notice of Appeal